digestibility of some of the materials treated has been increased fifty or more per cent.

At the Massachusetts Experiment Station studies of the effect of quite dilute sodium hydrate upon the digestibility of oat and rice hulls have been completed and gives a preliminary statement of the results.

It is evident that the action of the soda did improve the digestibility of the oat hulls to a marked degree and of the rice hulls to a limited extent. A thorough study is being made of the chemical composition of oat, barley, rice and cottonseed hulls, and of flax shives, and of the action of different strengths of sodium hydrate and of other chemicals in improving their digestibility.

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MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION,

THE AMERICAN CHEMICAL SOCIETY

(*Continued*)

DIVISION OF FERTILIZER CHEMISTRY

F. B. Carpenter, *chairman*
H. C. Moore, *secretary*

The briquetting of mineral phosphates a promising method of conservation: WILLIAM H. WAGGAMAN and H. W. EASTERWOOD. In connection with research work on the volatilization of phosphoric acid in a fuel fed furnace, preliminary work has shown that briquetting is a factor of prime importance. Samples from old phosphate deposits were found to be sufficiently high grade and contained enough natural binder (clay) to lend themselves to briquetting purposes. Also much phosphate rock from waste heaps could be used. It is only necessary to reduce the material for briquetting purposes to a point where it will pass a ten-mesh sieve and incorporate the necessary water into the mixture to give it the required plasticity. Where the composition of the material is such that sand must be added it was found that the necessary water could be added to the sand and coke and then this moistened mixture incorporated with the phosphate material. Coal presents a very promising possibility as a reducing agent in such briquettes since the volatile matter contained therein does not cause the briquettes to split open or disintegrate when heated.

Cyanamid in some fertilizer mixtures: W. S. LANDIS. A study of the behavior of Cyanamid in some fertilizer mixtures and in several standard brands of mixed fertilizer. The rapid conversion of cyanamid into urea and other salts was noted, but no dicyandiamid was found in any of the mixtures studied. Reactions with ammoniated base of both cyanamid and dicyandiamid were studied and unidentified complexes found to occur in such mixtures. Cyanamid when added in the proportions recommended for formulating this material did not change to dicyandiamid, and dicyandiamid intentionally added as such disappeared on mixing in such goods.

Comments on the formation of dicyandiamid in fertilizers: J. E. BRECKENRIDGE.

The value of the alkaline permanganate method: CHAS. S. CATHCART.

Remarks on the permanganate methods for the determining of availability of organic nitrogen: J. E. BRECKENRIDGE.

Ten years experience with the neutral permanganate method in South Carolina: R. N. BRACKETT.

The composition of cotton seed: THOS. C. LAW.

Cultivation and nitrogen fertilization: H. A. NOYES, J. H. MARTSOLF and H. T. KING. A study of the comparative effects of different degrees of cultivation shows that with proper cultivation the average soil contains enough organic matter to stimulate bacterial activities and allow nitrates to accumulate during the growing season. Virgin soil rich in available organic matter gives nitrates in great excess of those needed by the growing plants. In early spring soils are depleted of nitrates and an early application of available nitrogen fertilizer is desirable and beneficial to stimulate plant growth until such a time as the soil has warmed up and responded to cultivation in increased bacterial activities. In no case studied have the authors been able to find the need for a second application of nitrogen fertilizer later in the season unless the soil did not receive proper cultivation. Nitrate production and accumulation resulting from and associated with thorough cultivation have a money value more than equal to the cost of the second application of nitrogen fertilizer.

The effect of fertilizers of various compositions on the reaction of soils: J. J. SKINNER. The hydrogen ion concentration and lime requirements of soil fertilized with mixtures of various compositions are reported. In a fertilizer experiment with grass on the Hagerstown loam soil, acid phosphate, sodium nitrate, and potassium chloride was used singly, in combinations of two and in

combinations of three. The fertilizer constituents in the mixtures varied in ten per cent. stages, and is based on the triangle system. The soil has been fertilized annually for eleven years, using fifty pounds per acre of the constituents, P_2O_5, NH_3 and K_2O. The plots receiving mixtures of acid phosphate and potassium chloride have become acid, having a lower p_H value and a higher lime requirement than mixtures of acid phosphate, potassium chloride and sodium nitrate. The higher the p_H value and the smaller the lime requirement of the soils. Where the high nitrogen fertilizers were used, the subsoil has a lower p_H value than where high phosphorus acid mixtures were and the subsoil is more acid than the surface soil.

The present tendency of fertilizer experimentation: OSWALD SCHREINER.

Greensand as a source of fertilizer potash: R. NORRIS SHREVE. A process is described whereby the enormous resources of potash now latent in the greensand beds of New Jersey are made available for fertilizer use. The process involves treating greensand with milk of lime at about 470° Fahr. for one hour. Caustic potash is the initial product but it is easily changed into other potash compounds. Potassium nitrate is shown to be the best form in which to produce the greensand potash for the fertilizer industry. Attention is called to the combination of two fertilizer essentials, namely, nitrogen and potash, in the one chemical with the consequent saving in transportation charges.

The development of accuracy in fertilizer analysis and some pitfalls in methods: P. MCG. SHUEY. Greater accuracy may be attained in the determination of oxide of iron and alumina by precipitation of aluminum phosphate either alone or in conjunction with ferric phosphate by having acetic acid present in the precipitating medium. A higher degree of accuracy is also reached by determining the metals separately. It is shown that by obtaining the weight of the combined phosphates and simply dividing by 2, results may be appreciably high. There has been a great development in the accuracy of nitrogen determinations in organic materials such as cottonseed meal, peanut meal, etc., within the last few years, as shown by the results obtained by the American Oil Chemists' Society. However, more accurate determinations are needed for nitrogen where nitrates are present.

The determination of free acid in ammonium sulfate: C. G. ATWATER.

On the preparation of hydrochlorplatinic acid by means of hydrogen peroxide: PAUL RUDNICK. A solution of hydrochlorplatinic acid of the concentration required for the official Lindo-Gladding method of the A. O. A. C. for determining potash is readily prepared by converting the waste platinum from all sources into platinum black by any convenient means, dissolving the wet, well washed black by means of 30 per cent. hydrogen peroxide (free from organic preservatives) and hydrochloric acid gas, converting into potassium chlorplatinate and using only the pure potassium chlorplatinate so obtained as the starting point for the final solution. The chlorplatinate is dried and weighed, reduced with the purest obtainable sodium formate in alkaline solution, the resulting black washed by decantation only and without drying or igniting is suspended in 30 per cent. hydrogen peroxide and brought into solution by introduction of hydrochloric acid gas. Pyrex glass serves quite well for concentration of peroxide and for solution of the platinum black.

Various details in the determination of ammonia in cotton seed meal as summarized from eighty-six replies to a questionnaire sent to members of American Oil Chemists' Society: H. C. MOORE.

Wool scouring wastes for fertilizer purposes: F. P. VEITCH. More than 60,000 tons of fertilizer material combining the equivalent of 96,000 tons of kainit and 3,600 tons of tankage are now annually wasted in scouring wool. The U. S. Department of Agriculture has been making a careful study of the recovery and utilization of wool scouring wastes. A large number of samples of all grades of unscoured wool, of which this country uses more than 600,000,000 pounds annually, have been examined and it has been found that potash (K_2O) varies from 2 per cent. to 6 per cent. and averages approximately 4 per cent. for all grades; nitrogen varies from 3 per cent. to 0.9 per cent. and averages one half per cent., while grease varies from 3 per cent. to 30 per cent. and averages 15 per cent. for all grades. Both the potash and nitrogen are water soluble and therefore readily available to growing plants. Commercial base goods from concentrated wool scouring wastes and other wastes are rich in nitrogen. The "base goods" contained 6 per cent. of water soluble potash (K_2O) and 6 per cent. of nitrogen, was in excellent mechanical condition both for manufacturing and for application to the soil. The concentrated wool waste offers no difficulty in mixing with other fertilizer materials giving to the finished fertilizer a good

dark color and a strong odor, both of which are desirable properties for a fertilizer. The author is confident that this heretofore unused large store of fertilizer material can be made available to the fertilizer manufacturers and to the farmer and the damage and expense occasioned by the present practice of draining these wastes into the waters of the country can be greatly diminished.

The recovery of potash as a by-product in the blast furnace industry: WM. H. ROSS and ALBERT R. MERZ. The weighted average of the potash in the ores, coke and limestone used in the blast furnace industry amounts to approximately 0.2 per cent. for each material, which is less than one third as great as that found for the raw mix used in the cement industry. In the case of the ores, the potash ranges from 0.05 per cent. for Mesaba ores to over 2 per cent. for certain foreign ores. As the consumption of high potash ores is relatively small as compared with low potash ores, the weighted average of the potash in the ores consumed is less than the mean average found for different ore samples. On the basis of the weighted average the total potash in the ore, coke and limestone used in blast furnaces amounts, respectively, to 7.6, 1.8 and 4.5 lbs. per ton of pig iron, or to a total of 13.9 lbs. The potash in the slag amounts to 8.5 lbs., which leaves a balance for the potash volatilized of 5.4 lbs. per ton of pig iron. This amounts to a total for all plants of about 100,000 tons of potash as compared with 87,000 tons for the cement industry.

A historical review of the research showing the fertilizer value of sulphur: L. S. BUSHNELL. The writer proves the error of the last two of the following statements of Conn in "Agricultural Bacteriology": "In general, much less is known about the transformations of sulphur than of those of nitrogen. The reason for this is that sulphur is almost never deficient in soils, and the subject has never been considered of sufficient practical importance to justify extensive investigation." Results of research work conducted by various state experiment stations are cited where increase in yields from 50 to 1,000 per cent. were obtained when sulphur was used with alfalfa and other leguminous plants. It is shown that there is a decided loss of sulphur in soils cultivated for a number of years when compared with the corresponding virgin soils, and that the value of ammonium sulphate and acid phosphate as fertilizers is sometimes due to the sulphur and not to nitrogen or phosphorus. Attention is called to the faulty interpretation by others of Wolff's analyses of the ash of plants. Since large quantities of sulphur are lost by volatilization, the sulphur found in the ash is sometimes as little as one half per cent of the amount the plant contains.

Studies of the availability of organic nitrogenous compounds: C. S. ROBINSON. Various types of organic nitrogenous compounds containing definite atomic groupings were treated with alkaline permanganate solution according to the official method. The same thing was done with proteins and some organic base goods which were also analyzed by Van Slyke's method. Information was thus obtained as to specific groups ammonified by the permanganate method.

The preparation and composition of neutral ammoniun citrate solutions: C. S. ROBINSON. The work was divided into three parts as follows: (1) The preparation of solutions having definite compositions or reactions; (2) The relation between composition and reaction; (3) The relation between the reaction of the solution and its solvent action on calcium phosphate. It is shown that it is difficult to prepare a strictly neutral solution of ammoniun citrate with the usual indicators as ordinarily used. Physical chemical methods give accurate results but are not suitable for routine use. Analytical methods can be used to prepare any solution whose composition is fixed. The so-called colorimetric method using phenol red as the indicator is convenient and accurate. With citrate solutions ranging in reaction from pH 6.6 to 7.8 the magnitude of the variations in analytical results is usually small.

The potash situation: H. A. HUSTON. The potash situation was discussed from the standpoint of the relative quantities of soluble potash salts estimated by geologists to exist in the United States, France and Germany and development of these resources in the different countries. The geologists estimate that for each ton of soluble potash salts in the United States there are 10 tons in France and 6,000 tons in Germany. The estimated productive capacity of the existing potash properties in terms of actual potash is 80,000 tons for the United States, 250,000 tons for France and 3,850,000 tons for Germany. France has 13 completed shafts and 3 mills; Germany has 204 completed shafts and 17 mills. The ore suitable for producing sulfate of potash is not found in France.

CHARLES L. PARSONS,
Secretary